Tech Engr
ENGINEERING

UNIVERSITY OF ILLINOIS BULLETIN
ISSUED WEEKLY
VOL. XII MARCH 1, 1915 No. 26
(Entered as second-class matter December 11, 1912, at the post office at Urbana, Illinois, under the Act of August 24, 1912)

ILLINOIS MINERS' AND MECHANICS' INSTITUTES

R. Y. WILLIAMS, DIRECTOR

FIRST ANNUAL REPORT

OF THE

DIRECTOR

FOR THE YEAR
1914

LIBRARY
JAN 4 1916
UNIVERSITY OF

PUBLISHED BY THE UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

ILLINOIS MINERS' AND MECHANICS' INSTITUTES

R. Y. WILLIAMS, DIRECTOR

FIRST ANNUAL REPORT

OF THE

DIRECTOR

FOR THE YEAR

1914

PUBLISHED BY THE UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

TABLE OF CONTENTS

Purpose of the Institutes 5

Legislative history of the Institutes 5
The organic Act 7

Necessity for industrial education 8
Rapid development of the industry 8
Change in character of the mining population 9
Educational requirements that have been imposed upon the employees about the coal mines by legislative enactments 9

Industrial education for Illinois mine employees 9

The methods adopted by the Institutes 11
The two-year course of systematic instruction in mining centers 11
Unit courses in the smaller mining towns 16
Short course at the University 17
Cooperation with existing organizations 20
With the State Mining Board and Inspectors 21
With the Mine Rescue Station Commission 23
With first aid and other local organizations 23
With officials and locals of the United Mine Workers 24
With the United States Bureau of Mines 24
With high schools and grade schools 25
With libraries in mining towns 27
With the Y. M. C. A 27

Special activities 28
Organization of local institutes 28
Question and answer department 28
Traveling libraries, laboratory equipment, etc 29
Work for non-English speaking miners 31
Correspondence courses 32
Publications 33

Recommendations 33

Disbursements during the year 1914 34

ILLUSTRATIONS.

Fig. 1. Institute class at Springfield 6
Fig. 2. Institute class at Gillespie 10
Fig. 3. Institute class at Harrisburg 14
Fig. 4. Institute class at Thayer 18
Fig. 5. Institute class at Benton 22
Fig. 6. Institute class at Herrin 26
Fig. 7. Miners who completed the six-weeks short course at the University in 1914 30

THE ILLINOIS MINERS' AND MECHANICS' INSTITUTES

Administration vested in the Trustees of the University of Illinois.

University Committee

Edmund Janes James, Ph.D., LL.D., President
Charles Russ Richards, M.E., M.M.E., Professor of Mechanical Engineering, and Acting Dean of the College of Engineering
Harry Harkness Stoek, B.S., E.M., Professor of Mining Engineering

---

Staff

Robert Young Williams, A.B., E.M., Director,
203 Transportation Building, Urbana
Harry Draper Easton, B.S., E.M., Instructor,
1142 West Monroe St., Springfield
Edward Clarence Lee, B.S., E.M., Instructor,
Box 541, Herrin
William Llewelyn Morgan, Instructor,
R.R. No. 2, East St. Louis
Harvey Edson Smith, B.S., E.M., Instructor,
Urbana
Miss Ella S. Zipprodt, Clerk,
Urbana

Part-Time Instructors

Martin Bolt, 1526 College St., Springfield
John Dunlop, 414 Columbia Terrace, Peoria

Cooperating School Teachers

A. E. Arendt, Collinsville
Clarence Bonnell, Harrisburg
Kurt Busiek, Belleville
C. A. Chatten, Carterville
M. B. Coker, Troy
W. H. Creed, Caseyville
R. G. Crisenberry, Carterville
C. H. Dorris, Collinsville
Miss Emma Harris, Collinsville
H. L. Heath, Herrin
S. L. Kell, Benton
Miss Melitta Margaret, Collinsville
Ivan A. Palmer, Herrin
H. G. Schmidt, Belleville
T. H. Schutte, Herrin
Geo. W. Solomon, Gillespie

FIRST ANNUAL REPORT
OF THE
ILLINOIS MINERS' AND MECHANICS' INSTITUTES

R. Y. WILLIAMS, DIRECTOR

PURPOSE OF THE INSTITUTES

The general purpose of the Institutes is to prevent accidents in mines and other industrial plants and to conserve the resources of the State. To accomplish this purpose, the Institutes are authorized to promote the education and training of all classes of industrial workers.

In Illinois, there are nearly 80,000 men working in and about the coal mines. Only two other states have a larger production of coal than has Illinois, and in no other state is there as much unmined bituminous coal as there is in this state. Recognizing the importance of the coal industry in the present as well as the future development of Illinois, and knowing that the legislation establishing the Institutes was the result of inquiries following the Cherry mine fire, the Institutes have limited their activities during this biennium to educational work among coal mine employees.

LEGISLATIVE HISTORY OF THE INSTITUTES

At the special session of the Legislature in 1910, called as a result of the Cherry disaster, a bill was passed upon the recommendation of the Mining Investigation Commission establishing the Illinois Miners' and Mechanics' Institutes. The responsibility for the administration of the Institutes was placed upon the Trustees of the University of Illinois and an appropriation of $15,000 was made to carry on the work. The Attorney-General ruled that the Act was unconstitutional, as the subject of it was not mentioned in the Governor's call for the special session of the Legislature.

In 1911 the forty-seventh session of the State Legislature passed an Act which was approved by Governor Charles S. Deneen, May 25, 1911. This Act was essentially the same as the one passed in 1910 in so far as the authorization for establishing the Institutes was concerned but it carried no appropriation. A separate bill, making an appropriation of $15,000 for carrying on the work, passed the Senate and two readings in the House but failed of final passage; consequently it was impossible to begin the work as there were no funds

FIG. 1. INSTITUTE CLASS AT SPRINGFIELD.

available for the purpose. The forty-eighth session of the State Legislature in 1913, in the bill providing for the general expenses of the State Government, appropriated $15,000 per annum to the Trustees of the University of Illinois for the Miner's and Mechanics' Institutes. With such appropriation and under the Act of 1911 authorizing the Institutes, the Board of Trustees of the University of Illinois authorized the Department of Mining Engineering of the University to proceed with the work, and on January 1, 1914, the Director of the Miners' and Mechanics' Institutes was appointed.

The Organic Act

ILLINOIS MINERS' AND MECHANICS' INSTITUTES

(Senate Bill No. 259, Approved May 25, 1911).

AN ACT *to prevent accidents in mines and other industrial plants and to conserve the resources of the State by the establishment of Illinois Miners' and Mechanics' Institutes and for the administration and support of the same.*

SECTION 1. *Be it enacted by the People of the State of Illinois represented in the General Assembly;* That in order to prevent accidents in mines and other industrial plants and to conserve the resources of the State, by the education and training of all classes of workers in and about the mines and other industrial plants of the State, there shall be established and maintained a form of educational betterment work, which shall be known as the Illinois Miners' and Mechanics' Institutes.

SECTION 2. That it shall be the purpose of such Illinois Miners' and Mechanics' Institutes to promote the technical efficiency of all persons working in and about the mines and other industrial plants of the State and to assist them to better overcome the increasing difficulties of mining and other industrial employments. In the development of this purpose, any and all means may be employed which promise to give desired results such as bulletins, traveling libraries, lectures, correspondence work, classes for systematic instruction, or meetings for reading and discussion of papers.

SECTION 3. That the administration of the Illinois Miners' and Mechanics' Institutes, as provided in section 1 hereof, shall vest in the trustees of the University of Illinois; that all money appropriated by the State for the purpose of this Act shall be made available to said trustees; and that the said trustees be and hereby are authorized and directed to proceed with the work of the organization, maintenance

and administration through their regularly authorized agents, aided by such other persons as in their judgment the work may require.

SECTION 4. The State Board of Contracts is hereby authorized and directed to provide all necessary printing for the Illinois Miners' and Mechanics' Institutes, including such bulletins as may be published from time to time by the Illinois Miners' and Mechanics' Institutes.

Approved May 25, 1911.

NECESSITY FOR INDUSTRIAL EDUCATION

The operation and supervision of a mine is very different from that of a factory. In a mine the men work in small groups, frequently not more than two in a place and apart from the other workers, so that it is impossible to have the close supervision that obtains in a factory or shop, where a foreman can see a large number of men at one time. Hence all the employees about mines should be so qualified by training and experience that they will not jeopardize their own lives and the lives of their fellow-workers, and that the coal or other material may be efficiently mined.

In connection with the coal mining industry the three urgent reasons for industrial education are the rapid development of the industry, the change in character of the mining population, and the educational requirements that have been imposed upon the employees about the coal mines by legislative enactments.

Rapid Development of the Industry

The development of the coal industry in Illinois is shown by the following table of output and employees:

TABLE 1. PRODUCTION OF COAL AND NUMBER OF EMPLOYEES IN ILLINOIS MINES

Year	Production (short tons)	Employees
1870	2,624,163	6,301
1880	6,115,377	16,301
1889	15,292,420	30,076
1899	25,767,981	36,130
1910	45,900,246	72,645
1912	59,885,226	78,098
1913	61,846,204	79,497
1914	60,715,795	80,035

The science of coal mining has likewise advanced greatly, deeper mines have been opened, and machinery has replaced hand labor in many places. These improvements in mechanical and electrical appliances in and about the mines have greatly increased the complexity of the equipment and made necessary greater technical knowledge to operate the mines.

Change in Character of the Mining Population

An increasing number of non-English speaking men are entering the mines in Illinois. Formerly the coal miners were English-speaking and were either American by birth or had come to the United States directly from England, Scotland, Wales, Ireland or Germany, where they and their forefathers had been engaged in mining. At present the bulk of the mining is being done by men from southeastern Europe, often called Slavs, but under this term are included Huns, Poles, Italians, Greeks and Lithuanians. These men were mainly agriculturists in Europe, and although many of them had no knowledge of mining prior to their coming to America, they are frequently put into the mines soon after landing without preliminary training, and too often before they can speak or understand the English language.

These men should be instructed in the general principles of mining and in the rules and regulations for safety, and should be offered an opportunity to acquire a knowledge of colloquial English.

Educational Requirements That Have Been Imposed Upon the Employees About the Coal Mines by Legislative Enactments

The State of Illinois has by legal enactment set an educational standard in connection with coal mining that is more comprehensive and inclusive than prevails in any other similar industry in the State. Every applicant for a position as mine examiner, or hoisting engineer must have a certificate of competency certifying that he has passed a combined written and oral examination given by the State Mining Board. Every miner must have a certificate issued by the Miners' Examining Board and based upon an oral examination to determine his qualifications as a practical miner. Although these educational requirements have been in force for some years, until the establishment of the Institutes there was no provision made by the State for rendering assistance to the men who desired to fit themselves to satisfy the requirements imposed by the State.

INDUSTRIAL EDUCATION FOR ILLINOIS MINE EMPLOYEES

The conditions in Illinois are very different from those that prevail in the anthracite region of Pennsylvania, where a very successful institute movement has been carried on for a number of years under particularly favorable conditions, for there is a dense mining population in and about large cities, making it possible and comparatively easy for large numbers of mining men to assemble for meetings. The entire area of the anthracite region is less than 500

FIG. 2. INSTITUTE CLASS AT GILLESPIE.

square miles and only a small part of that area, owing to topographical reasons, is populated by the more than 150,000 employees engaged in the anthracite industry. In Illinois, on the other hand, about 80,000 employees are scattered over an area of 36,800 square miles, and there are very few districts where large numbers of the mine employees can get together easily. Consequently, the difficulty and cost of reaching a thousand men in Illinois for instructional purposes will of necessity be much greater than in a thickly settled district, such as the anthracite region, or in European countries. Also the time required to establish a comprehensive movement throughout the coal regions of Illinois must be correspondingly greater than in thickly populated regions and will depend largely upon the money available for carrying on the work.

THE METHODS ADOPTED BY THE INSTITUTES

The general methods adopted by the Institutes may be grouped under the following heads:

1. Two year course of systematic instruction at mining centers
2. Unit courses in mining towns
3. Short course at the University
4. Cooperation with existing organizations
    a. With the State Mining Board and inspectors
    b. With the Mine Rescue Station Commission
    c. With officials and locals of the United Mine Workers
    d. With the United States Bureau of Mines
    e. With high schools and grade schools
    f. With libraries in mining towns
    g. With first aid or other local organizations
    h. With the Y. M. C. A.
5. Special activities
    a. Organization of local institutes
    b. Question and answer department
    c. Traveling libraries, laboratory equipment, etc.
    d. Work for non-English speaking miners
    e. Correspondence courses.

The results which have been accomplished under each of these heads may be summarized as follows:

TWO YEAR COURSE OF SYSTEMATIC INSTRUCTION AT MINING CENTERS

This course has been designed for two classes of men: first, for men who are ambitious to prepare themselves for the State examina-

tions for mine inspector, mine manager, examiner and hoisting engineer: and second, for the men who are unwilling to remain all their lives familiar with only one part of mining, and want to have a general knowledge that will permit them to choose those jobs underground which will yield the maximum return for their efforts.

Men who want to know the best and safest methods that have been devised for any particular purpose, and men who have ingenuity for suggesting new ideas, have found this course to be of great practical benefit.

In order that the men who work hard at the face during the day may not be discouraged by attempting too much study, it has been the plan at each town where classes have been organized to hold two meetings each week and to spend two hours at each meeting. By dividing the general subject of coal mining into 16 topics, and by allotting such time to each topic as will cause the complete course to extend over a period of two years, the Institutes have offered a plan by which the men are able to continue full time at work while obtaining the desired technical knowledge. In this way, the student increases his practical experience at the same time that he gains a knowledge of the theory of mining and he finds that both the practical and technical work are advantageous to him in the position of enlarged responsibility for which he is striving.

The list of topics and the time devoted to each topic in the two year course are as follows:

Group	Number of course	Subject	Number of Evening Sessions
A	1	Methods of mining	10
	2	Timbering	5
B	3	Ventilation	8
	4	Mine gases and safety lamps	5
	5	Special underground rooms	2
C	6	Geology	5
	7	Surveying	10
D	8	Coal, a fuel	5
	9	Surface plant	5
	10	Steam	5
E	11	Hoisting	7
	12	Haulage	8
F	13	Fire protection	5
	14	Electricity	10
G	15	Drainage	6
	16	Explosives	9
		Review	7
		Total	112

The subjects in the above list have been arranged in seven groups, each of which requires fifteen evening sessions for lectures and discussions and one session for review, or a total of eight weeks for the completion of the courses in any group. A person interested in mining may enroll for any number of groups and will receive credit for the work accomplished.

Group "D," "E" and "F" have been specially designed to assist a person who intends to apply for certification as hoisting engineer.

Safety, efficiency, conservation, and the state mining law, are considered in their special application to each of the above topics.

Rescue work and first aid are given in cooperation with the Illinois Mine Rescue Station Commission and the U. S. Bureau of Mines.

Arithmetic is a study in which a large majority of the men in the classes are interested; during the past year nearly one-third of the time of each lecture has been devoted to a consideration of this subject, and in some towns separate classes have been organized to pay special attention to it. One student, 50 years of age, was unable at the time of enrolling in the class to perform simple addition. At the completion of the first course he was able to work in fractions.

The towns at which two-year courses have been inaugurated, the date of organization, the total number of evening sessions, and the attendance at each place, are as follows:

Towns	Counties	Date of organization 1914	Total number of evening sessions	Attendance	
				Average	Total
Belleville	St. Clair	March 18	39	17	674
Benton	Franklin	October 7	15	21	314
Centralia	Marion	October 7	23	22	506
Collinsville	Madison	April 2	52	29	1531
Gillespie	Macoupin	October 9	23	34	792
Harrisburg	Saline	March 23	63	19	1218
Herrin	Williamson	March 26	95	24	2294
Pekin	Tazewell	October 1	13	14	182
Peoria	Peoria	October 1	26	26	676
Springfield	Sangamon	October 5	23	40	923
Staunton	Macoupin	May 4	57	33	1892
Thayer	Sangamon	November 2	15	25	375
Troy	Madison	October 8	20	26	520
Totals			464	26	11,897

FIG. 3. INSTITUTE CLASS AT HARRISBURG.

The following statistics have been prepared to show the average age, conjugal relations, schooling and occupation of the men in attendance at the evening classes, per 1000 men enrolled:

a. Average age; 28 years, 9 months, 12 days

b. Conjugal relations;

Married	567	
Single	385	
Widowers	48	1000

c. Schooling;

Fifth grade and below	251	
Sixth to eighth grade	680	
Above eighth grade	69	1000
Correspondence courses	33	

d. Occupation;

Miners and loaders	644	
Engineers, firemen and electricians	84	
Drivers, trappers and motormen	76	
Mine Managers	72	
Clerks and outside	71	
Mine Examiners	38	
Timbermen and trackmen	7	
Shot firers	6	
Pumpmen	2	1000

The following list gives the names of 58 men who maintained a perfect record of attendance in one or more of the Institute courses.

1.	Ashworth, A. A.	Herrin
2.	Baglin, Thomas	Springfield
3.	Bellet, Louis	Herrin
4.	Bowen, B. F.	Herrin
5.	Brown, A. M.	Seneca
6.	Brown, John	Troy
7.	Busse, Walter	Centralia
8.	Butler, Oliver C	Staunton
9.	Cape, Sam	Eldorado
10.	Carlton, Perry	Springfield
11.	Cathcart, John	Harrisburg
12.	Cooper, Fredivick	Springfield
13.	Crorkin, Jas.	Troy
14.	Daniels, David	Herrin
15.	Erlinger, Elmer	Belleville
16.	Froud, Isaac C.	Springfield
17.	Gierten, Philip	Centralia
18.	Grobling, John	Benld

19. Hales, Thomas ..... Springfield
20. Harvey, Charles ..... Staunton
21. Hatfield, Lawrence ..... Centralia
22. Hemphill, Clarence ..... Gillespie
23. Hope, Milton Winford ..... Gillespie
24. Hoy, James ..... Staunton
25. Hunsinger, Ed. ..... Staunton
26. Jennings, Arlean ..... Eldorado
27. Kane, E. G. ..... Springfield
28. Kiss, Lawrence ..... Sawyerville
29. Lockhart, J. B ..... Springfield
30. Lockhart, Louis ..... Staunton
31. Maconaghie, Hugh A ..... Benton
32. Malitz, Frank, Jr ..... Troy
33. McGaw, Colin ..... Springfield
34. Meredith, David ..... Herrin
35. Moore, Bernie ..... Troy
36. Morgan, Edwin C ..... Staunton
37. Nesbit, Marion ..... Belleville
38. Oettel, Paul ..... Staunton
39. Overly, J. W ..... Staunton
40. Paterson, Francis ..... Springfield
41. Popham, J. H ..... Herrin
42. Rankin, John ..... Collinsville
43. Rodger, Malcolm ..... Springfield
44. Shannon, T. J ..... Staunton
45. Smith, W. T ..... Springfield
46. Sneed, W. J. Jr ..... Herrin
47. Sokatch, Andrew ..... Benld
48. Struthers, James ..... Gillespie
49. Stuckmeier, E. H ..... Centralia
50. Tarases, J. M ..... Springfield
51. Tarr, Joseph ..... Benld
52. Thomson, Wm. ..... Benton
53. Topnick, John ..... Collinsville
54. Verna, J. E ..... Herrin
55. Watson, Wm. ..... Benton
56. Willard, Chas. S ..... Gillespie
57. Wilson, D. H ..... Herrin
58. Wilson, Hugh ..... Staunton

UNIT COURSES IN THE SMALLER MINING TOWNS

A unit course is a term applied to a course where only one subject is taught at a time, and where a considerable interval of time is allowed to lapse before another unit is taken up. In the conduct of these unit courses, a practical mining man is placed in a district

where arrangements have been made for classes of fifteen or more men in each of eight towns. Once every three months the instructor visits each town in this circuit of eight and gives a two-weeks unit course which consists of two hours work on four evenings each week.

The subjects of the unit courses are chosen from among those listed above for the two-year course. After the completion of one unit, the men who have taken the course are permitted to select the topic for consideration at the next unit course three months later. In the meantime, reference books are made available, instruction pamphlets are distributed, and members of the course are asked to prepare discussions of various phases of the subject to be considered.

During the past year, the funds at the disposal of the Institutes were not sufficient for the appointment of an instructor to carry on a series of unit courses. The scheme was tried out, however, at two towns and the results suggest the successful application of this plan to the smaller mining towns.

In Franklin County, at the town of Sesser, one of the regular instructors held a unit course from June 22 to July 2. Twelve two-hour sessions were devoted to the study of mine gases, safety lamps and ventilation. The total enrollment was 25, the average attendance 20 and the total attendance was 240. In St. Clair County, at the town of Caseyville, a unit course was organized on November 24 and continued until the Collinsville class met at the New Webster school which made it possible for the Caseyville class to meet with the Collinsville class. Mine gases and arithmetic were studied during nine evenings. The average attendance was 10, making the total attendance 90. After the union of the two classes at Collinsville, Principal Creed at Caseyville conducted the course in Arithmetic every Wednesday evening.

SHORT COURSE AT THE UNIVERSITY

The short course at the University has been designed for two classes of mining men,

First, for those who desire to review their technical knowledge of the development and operation of coal mines, in order that they may apply to the State Mining Board for certification to the positions of mine inspector, mine manager, examiner and hoisting engineer.

Second, for superintendents, certified men, and others who wish to keep abreast of the times. The science of coal mining is developing rapidly, measuring its progress with leaps and bounds, and no better opportunity for the exchange of ideas on mining can be offered for the busy men about the mines than the short course at the University.

FIG. 4. INSTITUTE CLASS AT THAYER.

The following table gives the short course calendar for 1914.

THE SHORT COURSE AT THE UNIVERSITY OF ILLINOIS

Dates	Subjects for Discussion Morning Sessions 8 a. m. to 12, noon	Laboratory and Field Work Afternoon Sessions 2–5 p.m.
April 6–11	Geology Methods of mining Timbering	First aid training Drawing
April 13–18	Coal, a fuel Surface plant Steam	First aid training Drawing
April 20–25	Hoisting Haulage Fire protection	Mine rescue chamber Mining laboratory
April 27–May 2	Ventilation Surveying Special underground rooms	Mine rescue chamber Mining laboratory
May 4– 9	Electricity Mine gases and safety lamps Surveying	Surveying on the campus Safety lamp laboratory
May 11–16	Electricity Explosives Drainage	Surveying on the campus Safety lamp laboratory

The same subjects were discussed during the short course as have been mentioned in the schedule for the two year course, and the practical aspects of these topics were treated in the same manner as in the longer course. Because the men spent full time on this work the progress was very rapid; and because of the completeness of the University laboratories and equipment a great deal of ground was covered in the short six-weeks period.

For the benefit of those who could not remain for the full six weeks course, each applicant registered for the particular subjects in which he was especially interested and received credit for the work accomplished. In this way, a man who could spend only two weeks at Urbana was able not only to receive technical training in those subjects which appealed to him most strongly but he was able to enter the spirit of the Miners' and Mechanics' Institutes and of the University of Illinois in both of which departments he had a certain proprietorship.

During the short course, four hours each morning were spent in lectures and discussions which were conducted by the teaching staff of the University and of the Institutes and by men actively engaged in mining. During three hours each afternoon, courses were given in the mining laboratory, in surveying on the campus, and in rescue and first aid work at the University Mine Rescue Station. Representatives

of both the U. S. Bureau of Mines and the Illinois Mine Rescue Station Commission had charge of the rescue and first aid training, and it was thus possible for men to receive both State and National Certificates for proficiency in these subjects.

In the conduct of the short course, a large amount of personal attention was given to the needs of each student. For example, during the second week ten coal salesmen enrolled for the courses on "Coal, a Fuel," "Surface Plant," and "Steam." For these men additional courses on "Sales Letter Writing" and "Advertising and Selling" were arranged for the afternoon period in the place of "First Aid" and "Drawing."

A summary of the short course in 1914 is as follows:

Number of lectures	132
Laboratory sessions	43
Average attendance	7
Total attendance	1213
Total enrollment	33
Average age	27
Oldest man	46
Youngest man	18
Married	14
Single	19
Students at University	7
Instructors at University	4
Coal salesmen	10
Mine examiners	4
Night bosses	1
Engineers	1
Pumpmen	1
Mine Managers	1
Miners	3
Drivers	1

During the short course, four students obtained first aid and rescue certificates from the U. S. Bureau of Mines, and six men were awarded first aid certificates from the Illinois Mine Rescue Station Commission; after completing the course, two men took the State Mining Board examination, one man qualifying for mine manager and the other for mine examiner.

COOPERATION WITH EXISTING ORGANIZATIONS

The work of the Institutes is a pioneer movement in secondary mining education and is closely akin to vocational training. Each of these important branches of the general subject of education is

receiving a large amount of thought by educators throughout the country, and important decisions as to the final methods and control may be expected in the near future. In the meantime, the Institutes are able to put into practice those methods which seem best adapted to Illinois conditions, and are able to establish the needs of the coal mining industry along these lines and prepare the way for a more general movement in this direction.

Recognizing the preliminary nature of the first year's work among coal mine employees, and realizing that the local organizations are best able to interpret the needs of a particular community, the Institutes have invariably organized classes with the cooperation of some agency which has been able to give great assistance in the conduct of the work.

The cooperation with existing organizations has been as follows:

With the State Mining Board and Inspectors.

The State Mining Board is vested with the authority to certify men for the positions of State mine inspector, mine manager, mine examiner and hoisting engineer. In part, this certification is based on the technical knowledge of the applicant as shown on examination.

The Illinois Miners' and Mechanics' Institutes, by keeping in close touch with the State Mining Board and the Inspectors, have been able to assist applicants in preparing for these examinations and, when requested by the Board, to present statements of the technical work performed under their auspices.

In each district where night schools have been established, State and County mine inspectors have materially helped in the organization and conduct of the classes; and inspectors of other districts have expressed their accord with the work. The Institutes acknowledge indebtedness to the following men for their active cooperation:

Thomas Devlin,	State	Inspector,	Spring Valley
Archibald Frew,	"	"	Gillespie
William Hartman,	"	"	Belleville
Patrick Hogan,	"	"	Peoria
J. E. Jones,	"	"	Danville
John Kaney,	"	"	Centralia
George L. Morgan,	"	"	Benton
William Starks,	"	"	Georgetown
Edward Laughron,	County	"	Benton
Frank McKeown,	"	"	Springfield
James Walker,	"	"	Dorrisville

FIG. 5. INSTITUTE CLASS AT BENTON.

Through the kindness of the Secretary of the Mining Board, one of the traveling libraries of the Institutes was placed in the Board rooms and the Secretary acted as librarian, issuing books to the mining men in Springfield who were studying various coal problems.

With the Mine Rescue Station Commission.

This commission was established "for the purpose of providing prompt and efficient means of fighting mine fires and of saving lives and property jeopardized by fires, explosions or other accidents in coal mines in Illinois" and was authorized to give "instruction in first aid to the injured and similar technical subjects."

By cooperation with this commission the Institutes have been able to hold lectures and vocational courses in rescue stations and cars. Each of these departments has assisted the other in offering to men engaged in mining Illinois coal a practical and technical training to fit them for profitable employment in this great industry.

On October 5th, a two-year course was organized at Springfield and the class met at the Rescue Station building under an agreement with the Rescue Station Commission. Under a similar agreement, the Benton class met at the Benton Rescue Station for a short period. During the year the Institute instructors took the training in first aid and rescue work and obtained the certification of the Mine Rescue Station Commission. The men in charge of the rescue stations and the men on the rescue teams attended the meetings of the Institute classes wherever possible.

With First Aid and Other Local Organizations.

As a direct result of the work of the Mine Rescue Station Commission, there has been organized in Illinois a large number of first aid teams and association for the purpose of rendering immediate assistance to persons injured in and about the coal mines. These organizations hold frequent meetings for training and for the discussion of methods of safeguarding life at the mines.

The Illinois Miners' and Mechanics' Institutes recognize the self sacrificing interest of these men who are devoting much of their time to this humanitarian work, and offer to assist them by furnishing traveling libraries, by giving occasional lectures on mine safety, by arranging evening programs to follow first aid contests, and by the organization of local institutes.

Instructor Lee acted as recorder at the Saline County Mine Safety Association's First Aid meet at Harrisburg in May, and after the

contest he gave an illustrated lecture on "Safety in Mining." Instructor Easton acted as recorder at the first aid contests at Springfield in September and at Gillespie in December.

With Officials and Locals of the United Mine Workers.

The officials in District 13 of the United Mine Workers of America have materially assisted in the organization and conduct of the evening classes of the Institutes and have expressed themselves heartily in sympathy with the work.

There are many camps in Illinois where the local union headquarters are used not only as the place for their regular meetings, but also as a Club where the men convene for social purposes. When the members of a local union request it, the Institutes are glad to cooperate with them in increasing the club features at their meeting rooms by furnishing traveling libraries, by giving occasional lectures on mine safety, and by the organization of local institutes.

All the locals in towns where classes have been established have granted to the Institute instructors opportunity to explain the methods and purposes of the work, and many of the local officials have taken a great deal of interest in spreading information about the Institutes to the men in the mines. One local No. 578 changed the date of meeting to allow members to attend the Institute classes.

With the United States Bureau of Mines.

"The general purpose of the Bureau of Mines is to conduct in behalf of the public welfare, fundamental inquiries and investigations into the mining industry. The two phases of the industry of greatest national concern are safety and efficiency—safeguarding the lives of our miners and insuring the most efficient and least wasteful development and use of our mineral resources."

This Bureau cooperated with the Illinois Miners' and Mechanics' Institutes by furnishing free of cost to the men enrolled in the Institute courses, copies of bulletins, technical papers and circulars which refer to the subjects under discussion. Over 3500 copies of Bureau publications have been issued to the Institute students. Mining engineers of the Bureau of Mines have given talks before the Institute classes, some of the lectures being illustrated with stereopticon views and motion pictures. Through the courtesy of Chief Engineer H. M. Wilson, the Bureau of Mines made possible the purchase of a large number of lantern slides and other illustrative material.

With High Schools and Grade Schools.

The purpose of high schools and grade schools is to offer a general education for the all around development of the individual, the preparation to live well and to appreciate the fine things of life, art, music, literature and science.

The object of the Illinois Miners' and Mechanics' Institutes is to prepare the individual for profitable employment.

Many of the high and grade schools are located in districts where coal mines offer practically the only employment and where many of the pupils are looking forward to work in the mines as soon as the law will permit them to enter. Before the establishment of the Institutes some high schools in these districts had already requested assistance from the Department of Mining Engineering at the University of Illinois, but were unable to receive help because of lack of funds. Agreements have been made with a number of these schools by which the Illinois Miners' and Mechanics' Institutes offer assistance as follows:

1. By furnishing bulletins and outlines to the teachers to assist them in giving courses in chemistry, physics, mechanics, geology, etc., which will be of value to students who plan to enter the mines.

2. By offering instruction to the school pupils in the practice of coal mining in order that they may enter the dangerous and hazardous occupations in the mines with a working knowledge of the rules and regulations established for the safety of life and property.

3. By organizing evening classes for men who are employed during the day in the mines, in order that they may be fitted for more efficient service and more profitable employment in the mines. These classes have taken the form of the two-year course, the unit course, occasional lectures on mining subjects, and instruction to foreigners in the English language.

The School Boards have allowed the classes to meet without charge in the school buildings and to use the chemical and physical equipment. In most cases, light, heat and janitor service have also been provided free to the students.

The Institutes heartily acknowledge their indebtedness to the School Boards, Superintendents, and Teachers who have cooperated in the organization and conduct of evening classes, and who have been coequal with the Institutes in bringing about local interest and in maintaining successful courses. The following table gives a summary of the cooperating factors:

FIG. 6. INSTITUTE CLASS AT HERRIN.

COOPERATING SCHOOL BOARDS AND SUPERINTENDENTS

Town	County	Superintendent or Principal	Special Teachers
Belleville	St. Clair	George H. Busiek	H. G. Schmidt Kurt Busiek
Benton	Franklin	E. S. Lake	S. L. Kell
Centralia	Marion	E. V. Tubbs	
Collinsville	Madison	C. H. Dorris	C. H. Dorris A. E. Arendt Miss Emma Harris Miss Melitta Margaret
Gillespie	Macoupin	George Solomon, County Sup't.	George W. Solomon
Harrisburg	Saline	Harry Taylor	Clarence Bonnell
Herrin	Williamson	T. H. Schutte	T. H. Schutte H. L. Heath I. A. Palmer
Pekin	Tazewell	Robert C. Smith	
Peoria	Peoria	Anna E. Martin, Prin. Gerard T. Smith, Sup't.	
Springfield	Sangamon	H. S. Magill	H. F. Schneider
Staunton	Macoupin	W. E. Eccles	
Thayer	Sangamon	Miss Laura Mellish	
Troy	Madison	M. B. Coker	M. B. Coker W. L. Oliver

With Libraries in Mining Towns.

A great many books, technical magazines, and bulletins have been published which deal with the science and art of coal mining. This literature should be in the library of every mining town.

In an endeavor to interest local libraries, coal operators, and individuals in the purchase of books that are suitable for coal mine employees, the Institutes have reviewed a large number of these publications and will in the near future issue a circular which will indicate lists of the best books to buy with varying amounts of money.

With the Y. M. C. A.

As an outgrowth of experimental work at Oliver, Fayette County, Pennsylvania, in 1904-5, the Young Men's Christian Association was able to organize institutes and schools throughout the bituminous and anthracite districts of Pennsylvania, and later in Ohio and West

Virginia. The methods developed in this work by Mr. Charles L. Fay, Secretary of the Mining Department of the Pennsylvania Y. M. C. A., have been of great value in starting similar work in Illinois.

Through cooperation with Dr. Peter Roberts, international secretary of the Y. M. C. A., the Institutes have outlined a plan for the education of non-English speaking miners. This work is described in Bulletin 3, "English for Foreigners" by Peter Roberts and others.

The Institutes have been in close touch with the Illinois Y. M. C. A. Mr. Irwin Raut, Coal Miner's Secretary, has been a frequent visitor at the office of the Institutes and at the evening classes, and his endeavors have been largely responsible for the class which has been organized to begin work at Pana, early in January.

SPECIAL ACTIVITIES

There are a number of special activities in which it is possible for the Illinois Miners' and Mechanics' Institutes to assist the general movement for safety and efficiency in coal mining. It is too early, and the desires of the men at the mines have not been sufficiently expressed, to permit a complete statement of the methods that will be suggested for carrying on this phase of the work. The following outline, however, gives a general idea of the special features which have been under consideration during the past year:

Organization of Local Institutes.

It is believed that local institutes furnish the best opportunity to employers and employees to meet on the same footing for the discussion of subjects pertinent to coal mining. These institutes should be self-governing; but the Illinois Miners' and Mechanics' Institutes will be glad to assist in their formation and to take an active part in their conduct by furnishing lecturers, stereopticon equipment, reference books, editorship of papers, and general advice.

A bulletin will soon be issued with suggestions for the organization and management of local institutes in Illinois. These institutes would be of greatest benefit in mining districts where regular evening classes have been established.

Question and Answer Department.

The Illinois Miners' and Mechanics' Institutes have acknowledged and answered all reasonable questions which have been asked during the year. This department should be of great assistance in helping to

solve the problems at the mines because of its association with the following departments at the University of Illinois:

College of Engineering
Engineering Experiment Station
Library of the University of Illinois
United States Bureau of Mines
State Geological Survey
Cooperative Coal Mining Investigations.

Traveling Libraries, Laboratory Equipment, etc.

Books and technical papers, which treat on the subjects discussed in the two-year, the unit, and the correspondence courses, have been purchased and circulated from town to town as traveling libraries. A list of these publications is as follows:

TRAVELING LIBRARY

A Manual of Mining—Ihlseng and Wilson.
A Practical Arithmetic—Payne.
Coal Washing in Illinois—U. of I. Bulletin—Lincoln.
Colliery Manager's Handbook—Pamely.
Detection of Inflammable Gas and Vapour—Clowes.
Elementary Chemistry for Coal Mining Students—O'Shea.
Elementary Electricity and Magnetism—Jackson.
Essentials of Electricity—Timbie.
Examination Questions and Answers for certificates of Competency in Mining.
Handbook of Calculations for Engineers—Hawkins.
ICMI—Preliminary Report on Organization and Method of Investigation—Bulletin 1.
ICMI—Coal Mining Practice in District 8—Bulletin 2.
ICMI—The Purchase and Sale of Illinois Coal—Bulletin 3.
ICMI—Coal Mining Practice in District 7—Bulletin 4.
ICMI—Coal Mining Practice in District 1—Bulletin 5.
ICMI—Coal Mining Practice in District 5—Bulletin 6.
ICMI—Coal Mining Practice in District 2—Bulletin 7.
I.C.S.—Coal and Metal Miners' Pocketbook.
I.C.S.—37B Mine Gases, Mine Ventilation, Fuels, etc.
I.C.S.—38B Hoisting, Haulage, Drainage, etc.
I.C.S.—86 Rock Drilling, Blasting, etc.
I.C.S.—87 Drifts, Slopes and Shafts, etc.
I.C.S.—88 Surface arrangements, Coal washing, etc.
I.M.M.I.—Education of Mine Employees—Bulletin 1.
I.M.M.I.—Outline of Proposed Methods—Bulletin 2.

I.C.M.I.—Illinois Coal Mining Investigations.
I.C.S.—International Correspondence Schools.
I.M.M.I.—Illinois Miners' and Mechanics' Institutes.

FIG. 7. MINERS WHO COMPLETED THE SIX-WEEKS SHORT COURSE AT THE UNIVERSITY IN 1914.

Lectures on Mining—Galloway.
Mathematics for the Practical Man—Howe.
Maxims and Instruction for the Boiler Room—Hawkins.
Mine Foreman's Handbook—Mauchline.
Mine Gases and Explosions—Beard.
Mining Formulae—O'Donahue.
Mining Practice—Vol. 1—Bailes.
Mining Practice—Vol. 2—Bailes.
Mining Practice—Vol. 3—Bailes.
Mining Practice—Vol. 4—Bailes.
Mining Practice—Vol. 5—Bailes.
New Catechism of the Steam Engine—Hawkins.
Physics and Chemistry of Mining—Byron.
Self-taught Mechanical Drawing and Machine Design—Sylvester.
Steam Boilers—Shealy.
Surveying Manual—Pence and Ketchum.

A complete set of these books has been maintained in connection with the evening classes at each of the following towns: Herrin, Harrisburg, Belleville, Springfield, Thayer, Peoria, Centralia, Troy and Urbana.

In addition to this circulation of literature, the Institutes have purchased a traveling laboratory equipment in connection with the courses, this equipment containing lantern slides, safety lamps, gas analysis cabinets, surveying instruments, mechanisms for the demonstration of the practical application of physics, mechanics, and chemistry to coal mining, and an electrical outfit consisting of one generator, 4 motors, a switchboard, and meters for the measurement of electrical current.

Work for the non-English Speaking Miners.

An increasing number of non-English speaking men are entering the mines in Illinois. These men are ignorant of both our language and our customs and are often entirely unfamiliar with the details of mining. A detailed description of the change in the character of the mining population is given in Bulletin 1, "Education of Mine Employees," by H. H. Stoek.

In order to bring this important subject to the attention of coal operators, miners, teachers, and public spirited men and women whose interest is centered in communities where a large portion of the population is made up of foreigners, the Illinois Miners' and Mechanics' Institutes made a rapid survey investigating towns peopled by foreigners and arranged for a conference and short course during the summer session at the University of Illinois. It was the special aim to submit for discussion certain approved methods for carrying on

this work, in order that the best results might be obtained through a uniformity in practice. The proceedings of these meetings have been published in Bulletin 3, "English for Foreigners," by Peter Roberts and others.

The interest manifested at this conference showed that the time was propitious for the inauguration of a propaganda to help the communities of foreign speaking people in Illinois.

Because of the present small appropriation, the Institutes have been able to appoint only four instructors, and the greater part of their time has been devoted to the conduct of regular night schools for English-speaking miners who desire to increase their technical efficiency about the mines. These instructors, however, have all been in attendance at the conference and short course, have heard and discussed Dr. Roberts' lectures, and have been trained in the Roberts' method of teaching foreigners, having supplemented this training by conducting twice each week during the latter part of July and August classes among foreign employees at the shops of the Big Four Railroad at Urbana, Illinois.

In several cases where communities or individuals have desired to start classes for teaching English to foreigners, the Institutes have assisted in inaugurating the work by detailing one of the instructors to help the local teacher in acquiring the Roberts' method and to conduct one or more classes before foreigners in order to show the details of the application of the method. Such cooperation has been given to the teachers in Springfield, Peoria, Pocahontas, Breese, Troy, Collinsville, Glen Carbon, Staunton, Mascoutah, Freeman, O'Fallon, Worden, and Mt. Olive. As a result of this work, teachers at a number of high schools have maintained successful classes in English for foreigners.

Correspondence Courses.

Until June 30, 1915, only a small appropriation is available for the conduct of the Illinois Miners' and Mechanics' Institutes. It has been impossible, therefore, to provide regular courses as outlined above for all who may desire to be enrolled in this work.

It is planned when funds are available, as soon as the interest is manifest and as quickly as the details can be worked out, to offer correspondence courses. The lectures which are being prepared for the regular courses and which are being printed in pamphlets will form the basis on which the subject of the development and operation of coal mines will be treated through correspondence. It is suggested that those who are already enrolled in correspondence schools will find that the lectures and courses of the Institutes will assist them in the work that they are doing.

Publications.

During the year 1914, the Illinois Miners' and Mechanics' Institutes have issued 3 bulletins, 2 circulars and 3 instruction pamphlets. These publications have been distributed free to persons who are interested in secondary education or who are directly connected with the coal mining industry.

Name	Subject	Author	Pages	Edition
Bulletin 1	Education of Mine Employees	H. H. Stoek	136	5000
Bulletin 2	Outline of Proposed Methods	R. Y. Williams	27	5000
Bulletin 3	English for Foreigners	Peter Roberts and others	52	5000
Circular 1	Education of Foreign Miners	R. Y. Williams	8	5000
Circular 2	Table of Mine Gases	H. E. Smith and R. Y. Williams	1	7000
Instruction Pamphlet 1	Methods of Mining Coal	H. D. Easton E. C. Lee W. L. Morgan H. E. Smith	96	3000
Instruction Pamphlet 2	Mine Gases and Safety Lamps	R. Y. Williams and H. E. Smith	58	5000
Instruction Pamphlet 3	Ventilation	H. D. Easton E. C. Lee W. L. Morgan H. E. Smith	64	3000

RECOMMENDATIONS.

From the experience gained during 1914, it is believed that regular courses should be given two evenings each week in mining towns where more than 1000 miners reside, that unit courses should be held four nights each week for six weeks in towns where 200 to 1000 miners live, and that correspondence courses should be offered for miners who cannot be reached by the class work. A careful survey of the 269 mining communities of the State has shown that there are 25 of these larger towns suitable for regular classes, 85

smaller towns for unit courses, and 159 towns which can be reached through correspondence.

An estimate of the annual expense necessary to offer educational facilities to the 80,000 coal mine employees in Illinois is given in the following budget:

Items	25 Regular Courses at $1,000	85 Unit Courses at $200	Short Courses, Correspondence Courses and Special Courses	Total
Salaries	$15,000	$9,835	$8,665	$33,500
Expenses	7,500	4,048	1,952	13,500
Equipment and Overhead	2,500	3,117	2,383	8,000
Total	$25,000	$17,000	$13,000	$55,000

DISBURSEMENTS DURING THE YEAR 1914

	Jan. 1–June 30	July 1–Dec. 31	Total
SALARIES AND WAGES			
Instructional Salaries	3 738 44	5 887 48	9 625 92
Clerical Salaries	100 00	250 00	350 00
General Clerical Work	109 09	24 70	133 79
Lectures	213 00	62 50	275 50
Expert Services	87 50	422 50	510 00
EXPENSE			
Postage	37 50	100 00	137 50
Office Supplies	174 73	28 89	203 62
Printing		27 67	27 67
Telephone and Telegraph	23 76	22 77	46 53
Freight and Express	35 61	38 35	73 96
Traveling Expense	842 84	1 190 16	2 033 00
Publications	709 45	165 84	875 29
General Supplies	115 37	59 20	174 57
Blue Printing & Photographic Supplies		25 80	25 80
Rentals	10 00	12 50	22 50
Furniture Repairs		1 75	1 75
Office Equipment Repairs		43	43
Machinery Repairs		25 30	25 30
Building Repairs	13 57	17 58	31 15
EQUIPMENT			
Apparatus	1 632 56	652 69	2 285 25
Furniture and Fixtures	419 14	258 67	677 81
Office Equipment	153 90		153 90
Library	458 53	524 38	982 91
	§8 874 99	9 799 16	18 674 15

§Of this total $279.87 was expended in 1913 prior to the beginning of the active work of the Institutes.